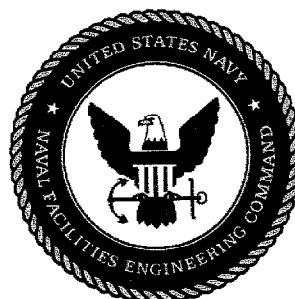


Final  
**Proposed Remedial Action Plan**  
**SWMU 15**  
NAS Oceana  
Virginia Beach, Virginia



Prepared for  
**Department of the Navy**  
**Atlantic Division**  
**Naval Facilities Engineering Command**  
**Norfolk, Virginia**

Contract No. N62470-95-D-6007  
CTO-0105

**September 2003**

Prepared by  
**CH2MHILL**

09/01/03-00633

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Proposed Remedial Action Plan  
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**Virginia Beach, Virginia**

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# Acronyms and Abbreviations

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BTEX	Benzene, Toluene, Ethylbenzene, and Xylene
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
CMS	Corrective Measures Study
COPC	Contaminants of Potential Concern
CT	Central Tendency
DoN	Department of the Navy
ERA	Ecological Risk Assessment
HHRA	Human Health Risk Assessment
HI	Hazard Index
IAS	Initial Assessment Study
MCL	Maximum Contaminant Level
MNA	Monitored Natural Attenuation
NAPL	Non-Aqueous Phase Liquid
NAS	Naval Air Station
NEPA	National Environmental Policy Act of 1969
PAHs	Polynuclear Aromatic Hydrocarbons
POL	Petroleum Oil Lubricant
PRAP	Proposed Remedial Action Plan
RBC	Risk Based Concentration
RCRA	Resource Conservation and Recovery Act
RFA	RCRA Facility Assessment
RFI	RCRA Facility Investigation
RME	Reasonable Maximum Exposure
SWMUs	Solid Waste Management Units
TPH	Total Petroleum Hydrocarbons
USEPA	U.S. Environmental Protection Agency
UST	Underground Storage Tank
VDEQ	Virginia Department of Environmental Quality



## SECTION 1

# Introduction

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The Department of the Navy (DoN) identified a preferred alternative to address contaminated soil and groundwater at Solid Waste Management Unit (SWMU) 15 located on Naval Air Station (NAS) Oceana, Virginia Beach, Virginia. The DoN's preferred alternative is no further action at this SWMU under the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA). Evaluation of the petroleum-related contamination of the groundwater will be addressed under a different regulatory program.

This Proposed Remedial Action Plan (PRAP) is based on site-related documents contained in the DoN's Administrative Record. The Administrative Record contains important background and site investigation information about the SWMU. The Administrative Record is located at:

Virginia Beach Public Library  
4100 Virginia Beach Boulevard  
Virginia Beach, Virginia 23452  
(757) 431-3000/3001

October 1 - May 31  
Monday-Thursday: 10 a.m. to 9 p.m.  
Friday and Saturday: 10 a.m. to 5 p.m.  
Sunday: 1 p.m. to 5 p.m.

June 1 - September 30  
Monday-Thursday: 10 a.m. to 9 p.m.  
Friday and Saturday: 10 a.m. to 5 p.m.  
Sunday: closed

The DoN needs your comments and suggestions. The DoN, the U.S. Environmental Protection Agency (USEPA) Region III, and the Virginia Department of Environmental Quality (VDEQ) encourage the public to review and comment on the action presented in this PRAP. The public comment period begins August 24, 2003, and closes on September 22, 2003. Please send your comments, postmarked no later than September 22, 2003 to:

Commander  
Atlantic Division  
Naval Facilities Engineering Command  
6506 Hampton Blvd.  
Norfolk, Virginia 23508-1278  
Attention: Public Affairs Officer, Mr. John E. Peters  
Phone: (757)322-8005 / FAX: (757)322-8187  
pao@efdlant.navfac.navy.mil

In addition, you are invited to a public meeting regarding the investigation of SWMU 15 at NAS Oceana. Representatives from the DoN will report on the status of these SWMUs and the DoN's preferred alternative. The meeting is scheduled for:

September 10, 2003, 7:00 p.m. to 9:00 p.m.  
NAS Oceana Officers Club  
NAS Oceana, Virginia Beach, Virginia

This PRAP describes the DoN's preferred alternative for SWMU 15. The DoN may modify the preferred alternative or select another remedial alternative if public comments or additional data indicate that such a change will result in a more appropriate remedial action. The DoN, in consultation with the USEPA and VDEQ, will make a remedy selection for SWMU 15 in a Decision Document after the public comment period has ended and the comments and information submitted during that time have been reviewed and considered.

SWMU 15 was initially investigated following the requirements of the NAS Oceana Resource Conservation and Recovery Act (RCRA) 3008 (h) Consent Order. However, in July 1998, the DoN and the USEPA agreed to conduct future site remediation activities at NAS Oceana following the procedural and substantive requirements of the CERCLA program, 42 U.S.C. §§9601 et seq., 10 U.S.C. §2701 et seq., and Executive Order 12580 (January 23, 1987). The DoN is issuing this PRAP as part of its public participation responsibilities under Sections 113(k) and 117(a) of CERCLA, as amended, commonly known as the "Superfund Program," and the National Environmental Policy Act of 1969 (NEPA). This PRAP focuses on SWMU 15. Other areas of NAS Oceana are addressed by separate PRAPs.

## SECTION 2

# Site Background

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NAS Oceana is located in Virginia Beach, Virginia (Figure 1). The base has been in existence since 1940 when it was established as a small auxiliary airfield. Since 1940, NAS Oceana has grown to more than 16 times its original size and is now a 6,000-acre master jet base supporting a community of more than 9,100 DoN personnel and 11,000 dependents. The primary mission of NAS Oceana is to provide the personnel, operations, maintenance, and training facilities to ensure that fighter and attack squadrons on aircraft carriers of the U.S. Atlantic Fleet are ready for deployment.

A total of 60 SWMUs were recommended for study in the Draft RCRA Consent Order issued by the USEPA. After reviewing the results of the Interim RCRA Facility Investigation (RFI), the DoN and the USEPA determined that only 19 SWMUs required investigation under the RCRA Consent Order; the remainder of the RCRA Facility Assessment (RFA) SWMUs were identified as being regulated under other federal and/or state programs, or as requiring no further investigation. Because of the proximity of four of the RFA SWMUs, they were consolidated into two; therefore, 17 SWMUs were included in the RFI under the consent order. The Phase I RFI recommended the 17 SWMUs be categorized in consideration of additional work required for each SWMU: 1) no further action, 2) site remediation (contaminant removal by excavation and offsite disposal), 3) development of remedial alternatives in a Corrective Measures Study (CMS), or 4) additional investigation in a follow-on RFI. SWMU 15 was recommended for additional investigation, which was accomplished as the RFI Phase II study. All previous investigation results and conclusions performed at SWMU 15 are summarized in this PRAP. The location of SWMU 15 is shown in Figure 2.

## SECTION 3

# **SWMU Background and Investigation History**

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This section contains a site description, habitat evaluation, summary of previous investigations, nature and extent of contamination, and a summary of human health and ecological site risks for SWMU 15.

## **3.1 SWMU 15 - Abandoned Tank Farm**

### **3.1.1 SWMU 15 Site Description**

SWMU 15 is located in the former North Station area, about 800 feet northwest of Runway 23R and 1,000 feet northeast of the area used to store recreation vehicles near the old Civilian Personnel Office officers' club (Figure 2). The SWMU 15 area includes an abandoned tank farm that served as the primary source of aircraft fuel for the North Station area when it was active from the mid-1950s to the mid-1970s. The tank farm consisted of six tanks: a 414,000-gallon tank used to store JP-3, two 50,000-gallon concrete tanks used for aviation gas, and three adjacent 12,000- to 18,000-gallon tanks believed to be used for automotive fuel, kerosene, or lube oil (RGH 1984). Petroleum releases from the tank farm operations are known to be the source of total petroleum hydrocarbons (TPH), polynuclear aromatic hydrocarbons (PAHs), and benzene, toluene, ethylbenzene, and xylene (BTEX) contamination at the site. These Petroleum, Oil, and Lubricant (POL) constituents were the primary focus of the investigations conducted under the NAS Oceana RCRA Consent Order.

According to a report by R.E. Wright Associates (1983), the tanks were emptied of fuel and filled with water after they were abandoned. Tank G-5 was later used to store waste oil, containing chlorinated compounds, from aircraft and vehicle maintenance operations; these constituents were also released into the environment from leaks in the tank and associated piping. The release of the chlorinated compounds is considered a CERCLA release; therefore, when it was agreed in 1998 to conduct future site remediation activities at NAS Oceana following CERCLA the subsequent investigations of SWMU 15 were conducted following the CERCLA process even though the primary site contaminants are POL related, which are exempted from CERCLA.

The tanks and their associated piping were dismantled and removed in the mid-1980s. With the exception of some mounded earth near the former location of tank G-9, no signs of the locations of the tanks or their associated piping were observed during the RFI (CH2M HILL 1993). Their locations were inferred from historical maps of the North Station area.

### **3.1.2 SWMU 15 Habitat Evaluation**

The area around SWMU 15 includes pavement, forests, shrubs, and wetlands. Old paved road surfaces and parking lots cover much of the site. In general, the site drains towards the northeast. A shallow drainage ditch crosses the center of the site, bisecting a small depressional wetland, and drains south to a large emergent wetland. No outlet from the

wetland has been observed. Water was observed in most of the ditch during a 1992 ecological survey, but the water did not appear to be flowing.

There is a large stand of mature loblolly pine immediately north of the former location of the tanks and mature hardwood stands occur mainly in the eastern half of the site. The shrub communities are located along old field areas and unpaved roadbeds. The area is colonized by an early successional upland herbaceous plant community.

### **3.1.3 SWMU 15 Previous Investigations**

SWMU 15 has been investigated seven times. The first investigation was conducted in 1982. The Initial Assessment Study (IAS) followed the first investigation. The results are published in the December 1984 IAS report. An RFA was conducted in 1988. The results are published in the RFA report (August 1988). SWMU 15 was investigated during two phases of the RFI. The results are published in the Phase I RFI report (December 1993), and the Phase II RFI report (February 1995). The two phases of the RFI were followed by the CMS. The results are published in the CMS report (March 1996). A Monitored Natural Attenuation (MNA) study was conducted for groundwater at SWMU 15. The results are published in the Study of Monitored Natural Attenuation report (April 2001).

### **3.1.4 SWMU 15 Nature and Extent of Contamination**

During the site investigations described above, the nature and extent of contamination was identified for each SWMU at NAS Oceana. The results of each of these investigations is summarized below.

#### **3.1.4.1 1982 Investigation**

During the 1982 sampling investigation, free-phase product was discovered in test pits and well borings.

#### **3.1.4.2 Initial Assessment Study**

The IAS identified the tank farm as a potential hazard.

#### **3.1.4.3 RCRA Facility Assessment**

The RFA identified the tank farm as SWMU 15 and documented recommendations for additional investigations.

#### **3.1.4.4 Phase I and II RCRA Facility Investigation**

SWMU 15 was investigated during two phases of the RFI. Phase I was completed in 1993 and Phase II was completed in 1995. The purpose of the RFIs was to characterize the extent of soil and groundwater contamination.

#### **3.1.4.5 Corrective Measures Study**

A CMS was initiated in 1995 to define the extent of the groundwater contaminant plume, characterize surface soil contamination, and obtain treatability data on contaminated soil and groundwater.

Results of the investigations conducted at SWMU 15 indicated that surface soils contained elevated levels of TPH and PAHs, and subsurface soils contain elevated concentrations BTEX, TPH, and PAHs. Groundwater was found to contain free-phase petroleum and elevated concentrations of BTEX, TPH, and PAHs. Chlorinated compounds (the CERCLA release), vinyl chloride and isomers of 1,2-dichloroethylene, were also detected at low concentrations in a few monitoring wells. The CMS recommended treatment for soil contamination and MNA of petroleum contamination in the groundwater. Based on recommendations from the CMS, a soil removal action was conducted at SWMU 15 in 1997 to remediate the BTEX contamination in the soil. This soil removal action was initiated under the RCRA Consent Order and completed following the CERCLA process. An area measuring about 150 feet by 125 feet was excavated to the water table, creating a small pond. The man-made pond is located southwest of the drainage ditch. Roughly 18,000 cubic yards of soil were treated onsite by bioremediation and aeration.

Confirmatory soil samples were collected to ensure all soils above the target cleanup value were excavated for biological treatment, and also at the conclusion of the biological treatment process to ensure that the cleanup criteria had been achieved. Additional soil samples were collected from the biopile to perform a Human Health Risk Assessment (HHRA) on the biopile soils to determine the potential reuse of the remediated soils. The HHRA determined that the noncarcinogenic and carcinogenic risks for the exposure pathways evaluated in the assessment were within the USEPA's target risk levels based on residential and recreational exposure scenarios. An ecological risk assessment (ERA) performed on the biopile soils involved additional surface soil sampling to determine whether or not PAHs were of concern to potential ecological receptors. Concentrations of the PAHs, specifically benzo(a)pyrene, benzo(k)fluoranthene, fluoranthene, and pyrene, were elevated in a small portion of the samples, but when compared to equally high levels of the same PAHs in background soil samples, these were not seen as a concern. The ERA concluded that PAHs were not considered to be a concern in the biopile soils and no further action was necessary. The treated soils were distributed as topsoil for a runway restoration project.

#### **3.1.4.6 Monitored Natural Attenuation Study**

In 1999/2000, an MNA study was performed primarily to determine the overall distribution of BTEX contamination (and its degradation products) (CERCLA-excluded contaminants) in the site groundwater, and assess the potential for BTEX to naturally attenuate within the aquifer. This study involved the sampling of the site's 14 groundwater monitoring wells, and a comprehensive collection of 45 in-situ groundwater samples from 30 sampling locations using a direct push technology (DPT). The presence of chlorinated compounds was also evaluated during this investigation.

The study determined that the chlorinated compounds, vinyl chloride and isomers of 1,2-dichloroethylene, detected at low concentrations during the CMS had degraded to non-detectable levels. The only non-BTEX volatile organic compound detected during this investigation was 1,1-dichloroethane. This compound was detected in five of the DPT samples with a maximum concentration of 4.3 µg/L; however, 1,1-dichloroethane was detected well below the corresponding USEPA Region III Tap Water Risk Based Concentration (RBC), 800 µg/L.

### 3.1.5 SWMU 15 Summary of Site Risks

Following the completion of the removal action and biological treatment of excavated soils, an evaluation of risk to human health was conducted as part of HHRA performed for the remainder of the SWMU 15 site (CH2M HILL 2001). Potential risks were calculated for a current industrial worker, current adult trespasser/visitor, current adolescent trespasser/visitor, future adult resident, future child resident, future lifetime resident, future construction worker, future industrial worker, future adult trespasser/visitor, and adolescent trespasser/visitor.

The SWMU as a whole was also evaluated for ecological risk. The results of the ERA are documented below.

#### 3.1.5.1 Human Health Risk Assessment

The potential risks to the evaluated human receptors exposed to the contamination resulting from the CERCLA release are summarized for each environmental media evaluated: surface soil, combined surface and subsurface soil, groundwater, surface water, and sediment.

Risks associated with potential current exposure to surface soil were evaluated for an industrial worker and an adult and adolescent trespasser/visitor. The Reasonable Maximum Exposure (RME) noncarcinogenic hazards to all potential current receptors exposed to contamination resulting from the CERCLA release in the surface soil are below the USEPA's target noncarcinogenic hazard level. The RME carcinogenic risks for all potential current receptors exposed to contamination resulting from the CERCLA release in the surface soil is within USEPA's target risk range.

Risks associated with potential future exposure to combined surface and subsurface soil were calculated for an industrial worker, a construction worker, an adult and adolescent trespasser/visitor, and an adult and child resident. The RME noncarcinogenic hazards (by target organ) to all potential current receptors exposed to contamination resulting from the CERCLA release in the combined surface and subsurface soil are below the USEPA's target noncarcinogenic hazard level. The RME carcinogenic risks for all potential current receptors exposed to contamination resulting from the CERCLA release in the combined surface and subsurface soil is within USEPA's target risk range.

The potential future exposure to groundwater was evaluated under a future residential and construction worker exposure scenario. The RME noncarcinogenic hazards for future residential use of the groundwater with contamination resulting from the CERCLA release is below the USEPA's target noncarcinogenic hazard level. The RME carcinogenic risks for future residential use of the groundwater with contamination resulting from the CERCLA release is within USEPA's target risk range. Exposure to the shallow groundwater by a construction worker during excavation was also evaluated as a potential future exposure scenario. The RME noncarcinogenic risk exceeds the USEPA's target HI. This hazard is primarily associated with inhalation of volatilized chloroform. However, as this compound was only detected in one monitoring well during the sampling event used for the risk determination and not detected in the same well less than 8 months later during the MNA investigation and that this compound is a common laboratory contaminant, this compound is not considered site-related. The RME carcinogenic risk is within the USEPA's target risk range.

The calculated CT noncarcinogenic hazards for all of the receptors exceeded the USEPA's target HI. The lifetime residential CT carcinogenic risk exceeds the USEPA's target risk range.

There were no constituents of potential concern (COPCs) retained for the surface water in the pond. Therefore, risks were not quantified for this medium.

Exposure to pond sediment was evaluated for adult and adolescent trespassers/visitors. The RME noncarcinogenic are below the USEPA's target HI. The carcinogenic risks are below the USEPA's target risk range.

### **3.1.5.2 Ecological Risk Assessment**

An evaluation of risk to ecological receptors was conducted as part of the ERA performed for SWMU 15 (CH2M HILL 2001a). The final ERA concluded that potential risks to aquatic organisms using SWMU 15 are expected to be low based on the magnitude of the sediment and food web exceedences. Potential risks to upper trophic level terrestrial organisms inhabiting SWMU 15 are low. Potential risks to lower trophic level terrestrial organisms (e.g., soil invertebrates) are relatively high based on the magnitude of the surface soil exceedences for PAHs; however, they occur in an isolated area (in surface soil adjacent to the former source area, the ponded excavation).

Based upon the results and the certainty associated with the results, the relative size of this SWMU, and the proximity of SWMU 15 to an active military runway/airfield, site-specific toxicity testing or additional sampling on which to base remedial action decisions is not warranted. Therefore, no further study in the risk assessment was recommended.



## SECTION 4

# Regulatory Oversight Transfer

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## 4.1 SWMU 15 Groundwater

The primary regulatory framework for the evaluation of groundwater contaminated by SWMU 15 is being transferred from CERCLA to the VDEQ Underground Storage Tank (UST/POL) program. SWMU 15 has most recently been investigated under the CERCLA program (by a RCRA Administrative Order on Consent). Data from these investigations indicate remaining constituents in SWMU 15 groundwater are related to petroleum compounds, which are excluded from CERCLA actions.

Based on the information available from previous investigations, SWMU 15 should be transferred from the CERCLA regulatory framework to the VDEQ UST/POL Program because:

- The HHRA indicates that exposure to the groundwater in SWMU 15 poses a risk due to the presence of inorganic and fuel related products, not chlorinated solvents (the CERCLA release). POL compounds and other constituents related to these exempted POL constituents are specifically excluded from CERCLA actions. Therefore, the risk posed from these compounds should not be included in assessing the risk under CERCLA.
- The 2000 groundwater sampling results indicate that of the 14 monitoring wells within the boundary of SWMU 15, only 2 had concentrations that exceeded the MCL or preliminary remediation goals for one or more volatile organic compound; the constituent exceeding the MCL (benzene) is related to fuel/petroleum products.
- Of the inorganics detected at elevated concentrations within SWMU 15, only arsenic (detected at 18 and 19.6  $\mu\text{g/L}$ ) exceeds its corresponding MCL of 10  $\mu\text{g/L}$ . An increase in inorganic concentrations, specifically arsenic, has been observed at sites where degradation of petroleum products is occurring. Therefore, it can likely be demonstrated that these inorganics are directly related to the POL at the site.
- The chlorinated solvents previously detected at SWMU 15 have shown a historical trend of decreasing concentration. In the most recent groundwater investigation of the site, these compounds were not detected at levels that pose an unacceptable risk to human health or at levels exceeding their corresponding MCL. This reduction is likely due to natural degradation and/or attenuation processes.
- Chloroform and methylene chloride were risk drivers in the HHRA. These compounds were detected in one monitoring well during the 1999 sampling event and are common laboratory contaminants. These compounds were not detected in the same well less than 8 months later during the comprehensive groundwater investigation of the site.

## SECTION 5

# Preferred Alternative

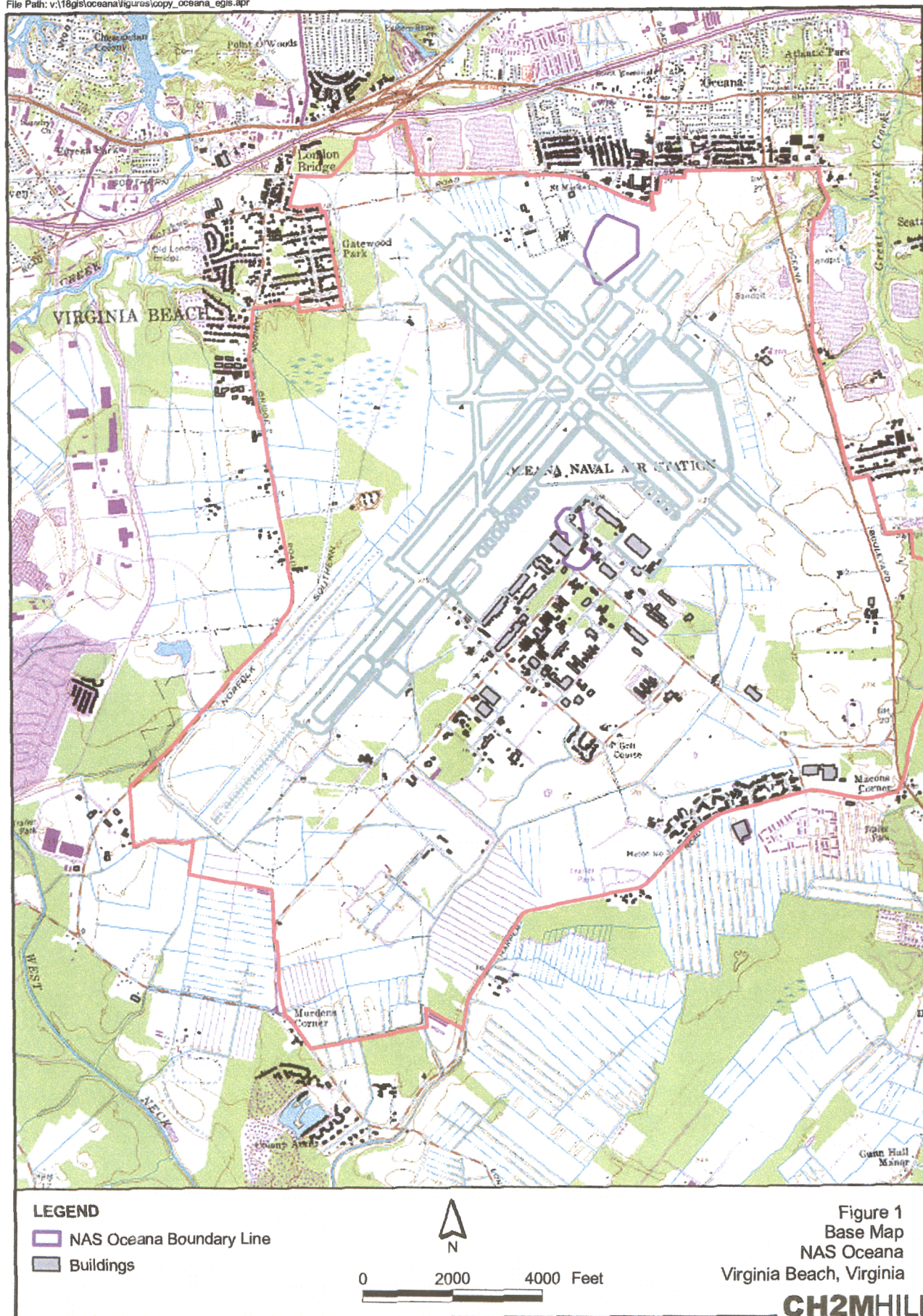
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The DoN seeks to close-out the CERCLA actions at SWMU 15 under CERCLA and thus the associated 3008(h) Consent Order requirements. SWMU 15 was initially investigated following the requirements of the NAS Oceana RCRA 3008(h) Consent Order. However, the DoN and the USEPA later agreed to conduct future site remediation activities at NAS Oceana following the procedural and substantive requirements of the CERCLA program. Future regulatory oversight for this SWMU will be implemented in accordance with the VDEQ's UST/POL Program.

The previous sections of this PRAP document the nature and extent of contamination at SWMU 15, and present a summary of human health and ecological risks posed by conditions at this SWMU. In accordance with 40 CFR Section 300.430(f)(2), the assessment of risk information as related to both human health and the environment is detailed in the preceding Summary of Site Risk sections for this SWMU. These sections provide the investigation summary information and rationale to determine that the environmental media (soils, groundwater, surface water, and sediment) contaminated from a CERCLA release at this SWMU pose no unacceptable risk to human health or the environment. Therefore, pursuant to 40 CFR Section 300.425(e)(1)(iii), the taking of further remedial measures at SWMU 15 is not warranted. Therefore, no further action is recommended by the DoN as the preferred alternative for SWMU 15. The estimated cost to implement this alternative is \$0.

## Figures

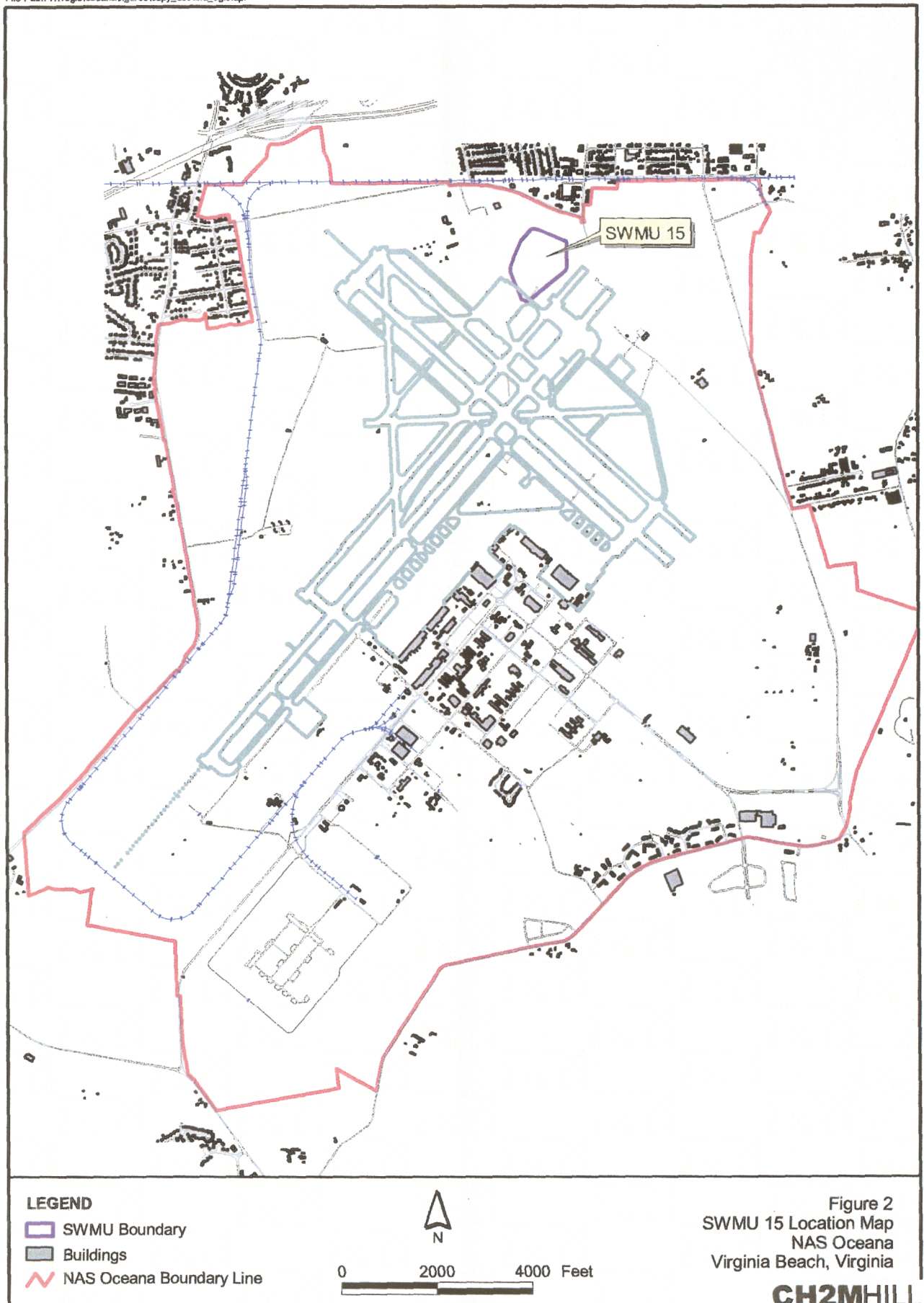
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**LEGEND**

 SWMU Boundary



0 200 400 Feet

Figure 3  
Site Location Map  
SWMU 15  
NAS Oceana  
Virginia Beach, Virginia

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